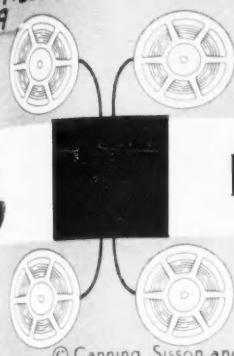


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DATA PROCESSING DIGEST

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NUMBER 10

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OCTOBER 1956

Management Decision-making Techniques

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"A mathematical model for integrated business systems"

Irving J. Lieberman, *Litton Industries, Beverly Hills, Calif.*
MANAGEMENT SCIENCE, July 1956; pages 327-336.

The author proposes "a mathematical technique for investigating integrated business systems....based on the mathematical notion of matrices." The model is based upon the assumption that "the information requirements of the various business functions are known. The problem is to find an optimal data processing system for such requirements, given a series of 'report levels.'" The article describes the construction of matrices describing the details of the data flow in hypothetical situations. Eventually, by manipulating the various matrices, it can be seen clearly how efficient, or how redundant a reporting system may be. "The model can be made to describe the real information flow and processing by the introduction of operation matrices. This gives us the facility to reduce the system to a minimal from the operating and economic point of view.... Not only does the model enable the analyst to picture the whole of a very complicated situation in a relatively simplified form, but the model offers other advantages. For example, because the relationships are delineated and grouped so precisely, it becomes relatively easy to divide the systems study work among the members of an analysis group.... Equally important, because the items are defined clearly and their flows established, it becomes much easier to provide the electronics engineers with the volume, quality and routing specifications which are so hard to obtain for present data processing systems....Another advantage is the experimentation which can be carried on with the model...without disturbing the actual system....and...the important opportunity which is offered the analyst to incorporate in his system the advances which are taking place in programming, scheduling, and feedback--both conceptually and in terms of electronic equipment."

CONTENTS

1 Management Decision-making Techniques

2 General Information

6 Programming

7 Applications

8 Equipment

10 Training

11 Meetings

12 References

General Information

"Electronics application: large organization"

Gordon R. Corey, Commonwealth Edison Co., Chicago
OFFICE EXECUTIVE, August 1956; pages 20-22.

*Programming time
was underestimated*

Since July 1955, Commonwealth Edison Company has been converting portions of its centralized accounting activities to a rented IBM 702 computer. The company has continually mechanized and centralized its accounting operations over the past 24 years. In 1953 Arthur Andersen and Company was retained to assist in studying the areas for conversion to electronic systems. Subsequent programming of the systems was aided by the preliminary detailed systems study of the existing system. It was found that "paying too much attention to the details of an existing system is a fallacy if those details are a product of the system itself, for the new system design may be improperly influenced." However, "it is most important to recognize all exceptions or irregularities that are characteristic of the business....then the computer plans and management policy will at least be in phase." In preparing billing programs, the procedures men had to debug and perfect programs involving 85,000 separate instructions. And such a process is a never-ending one, as programs must be continuously refined and revised. The company discovered that its time estimates were considerably short of actual requirements. For example, the development of the computational procedures and programs took 35 man-years, against the estimated 20. The debugging operation took nearly 15 man-years and 1000 computer hours. The entire programming and debugging preparation spanned 18 months, three months more than had been anticipated.

In setting up the work assignments and organization of the computing system, the company decided that, at least until experience proved otherwise, the console operator should be on the employee payroll, and a union man. However, all of the machine procedures analysts are management men, since this work involves planning and policy-making of a management nature. Six employee-status jobs have been established in the programming field.

In the area of employee education, little training of a general nature was attempted. Rather, those employees whose work would be directly affected by the system were given specific training for the application at hand. All employees, however, plus stockholders and the public, were informed of the plans for the computer installation. Normal turnover has been allowed to compensate for those jobs eliminated by the computer.

*New job created
for record-keeping*

A Manager of Accounting position was created, reporting directly to the Vice President, and responsible for record-keeping operations. The Comptroller continues to be responsible for the accounting and auditing functions, and prescribes the form of the accounting records kept by the Manager of Accounting. All of the computing equipment and related tabu-

lating equipment is centralized in the Data Processing Department. In addition to the computer installation, an operations research function was created to make use of the computer's abilities in this field, and this staff is in the office of the Comptroller.

"Deciding upon an electronic data processing system"

*Wesley S. Bagby, Pacific Mutual Life Insurance Co., Los Angeles
JOURNAL OF MACHINE ACCOUNTING, July 1956, pages 19, 22.*

*Entire ordinary life operation
by electronics*

Pacific Mutual began its study of electronic applications in September 1952. By the following July the company was ready to appoint a committee to be responsible for the electronic systems to be designed and a 4-man staff to be trained in programming. The small size of the company did not allow a single application to justify the electronic system. Instead it was believed that the entire ordinary insurance operations would fill the justification requirements. Every job in the department which might be affected by the system was then inventoried and a time study kept for every employee for a month. At the same time, a comprehensive program was established to orient the employees on the subject of electronic data processing. Pacific Mutual believes that "a planned program of employee education is important to morale, and necessary to insure cooperation in whatever course management decides upon."

The studies showed that in the six departments whose work was affected about 55 per cent of the total man-hours could be eliminated by the data processing system. It was found that "a total outlay of \$2 million for a large-scale system would pay its way fully in five or six years on this one ordinary insurance operations application alone."

Four more tasks now began. 1) Programming and coding personnel were selected and trained, two-thirds coming from within the organization. 2) Space planning was begun for the housing of the equipment and the personnel. About 7000 square feet were needed in addition to all the space being used for the old methods to begin the program; although final cut-over will make 10,000 square feet available from replaced job stations. 3) Every proposed change in existing conventional methods was analyzed to make sure it would be compatible with the new system. 4) The personnel department began to plan for moving employees who would be displaced by the system into job openings in unaffected departments.

The company discovered that actual site preparation cost near \$150,000, although their "conservative" estimate had been \$85,000. Data conversion is now taking place from punch cards to magnetic tape. Duplicate records on cards and tape are being kept, and parallel runs will be made on the old and the new methods for several months before final cut-over.

*Basic text
on experienced users*

"Pioneering in electronic data processing--Report #9"

AMERICAN MANAGEMENT ASSOCIATION, 1956.

Some of the best-known pioneers in the field of electronic business systems are included in the eleven articles and introduction which make up this report. The report is based on papers drawn from the AMA's conference "Electronics at Work," held in February 1956. Articles on feasibility studies: Robert T. Bruce, J. P. Stevens & Co.; W. Clayton Hill, Hotpoint; Robert E. Slater, John Hancock Insurance. Articles on personnel problems in installing electronic systems: Wesley Bagby, Pacific Mutual Insurance; F. J. Porter, Jr., Consolidated Edison; J. W. Carr, III, University of Michigan. Articles on applications: Kermit A. Pickett and Ralph M. Gilmore, Jr., Chrysler; Albert C. Vanselow, Franklin Life. Articles on management by electronics: Ethan S. MacMichael, U.S. Steel American Bridge Division; Benjamin B. Butler, General Electric; Edwin W. Rawlings, Air Materiel Command, USAF. This is a basic requirement for the complete EDP library.

"Impact of electronics on data processing"

C. J. Craft, Price Waterhouse & Co.

SYSTEMS AND PROCEDURES QUARTERLY, August 1956; pages 3-5.

Advantages and disadvantages

Advantages and limitations of electronic computers are given. Advantages: 1) tremendous capacity for storage of information, 2) unique ability to perform logical or decision-making functions, 3) extremely fast computing and processing speeds, 4) "almost unbelievable" accuracy, 5) ability to store and automatically follow a program. Limitations: 1) require great skill to program, 2) computer operations must be planned in great detail, 3) skilled maintenance engineers are needed, 4) poorly designed accounting procedures can permit inaccurate data to be processed, resulting in costly machine delays, 5) the high cost of computers precludes using them for non-repetitive operations.

"Electronic application: medium-size companies"

Sidney Lyons, Arthur Andersen Co., Chicago

OFFICE EXECUTIVE, August 1956; pages 23-27.

*Computer study
for competitive position*

The author states that "most companies should be doing something about electronics....because of the potential evolution of electronics as a significant competitive tool."

The conventional procedure for a computer feasibility study is then suggested, consisting of the policy committee, the study group, the training of the group, the review of present systems, design of the system, cost analyses, evaluation and selection of equipment.

"Creation of an electronic office"

Brian A. Elliott

THE ACCOUNTANT, July 28, 1956; pages 75, 76.

Feasibility studies in England

Employee training, cost analysis, and the question of purchase or use of service centers are some of the factors in preparing for electronic business systems, as described for the United Kingdom business world.

"Automation, a report of the Department of Scientific and Industrial Research"

Published by Her Majesty's Stationery Office, London, England

Automation in the United Kingdom

English thinking is inclined to consider office automation and plant automation as two parts of the same subject to a far greater extent than does American thinking. This is shown both in the small text "Automation--Friend or Foe?" and in the government publication "Automation." The latter includes short sections on office automation within the larger context of automation in general and its impact upon labor. Of interest to those persons in England who contemplate taking training in programming of electronic computers, is the list of twelve college or university courses on pages 88 and 89. A copy of the report may be obtained from Her Majesty's Stationery Office in London, or from the British Information Services, 50 Rockefeller Plaza, New York 20, N. Y. Price: \$1.16 postpaid.

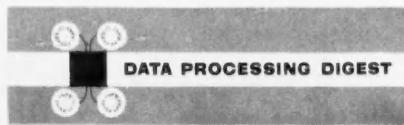
"Automation--friend or foe?"

R. H. MacMillan, University of Cambridge, England

Published by Cambridge University Press, 1956.

A primer on automation

Judging from the English technical press, the industrialists of Great Britain are as actively aware of "automation" as are industrialists in the U.S. Although this small volume is somewhat beyond the scope of DPD (which is largely confined to the use of electronic equipment in business systems), it is recommended to those who are interested in the concept of automation but who do not know any technical jargon. The first chapter gives a short but entertaining history of automatic control devices. Chapter II describes the evolution of automatic production in its three aspects: material handling, inspection, control. The economics of the automatic factory, a short description of "automatic computers," and a look into the future complete the book. Price: \$1.95.



October, 1956

Programming

Approximate memory locations
are computed for items
before search starts

"Sorting by address calculation"

E. J. Isaac and R. C. Singleton, *Stanford Research Institute, Menlo Park, Calif.*
JOURNAL OF ASSOCIATION FOR COMPUTING MACHINERY, July 1956; pages 169-174.

It is suggested that a mathematical expression be calculated by the computer to find the approximate addresses of items to be sorted. "To sort an item, an address is calculated from the key with the sorting function ((the mathematical expression)). The machine examines the contents of that location. If zero, the item is inserted. If not zero, the machine compares the contents of the location with the item and makes a decision as to whether to search upward or downward for the proper location in which to insert the item. Once begun, a search upward continues until either an empty location is found or an item with a larger key. When an item with a larger key is found, the item is inserted in place of the larger item and each subsequent item moved up one by one until the first empty space is found." Searching downward follows a similar pattern. "An overflow section is allowed at each end of the memory range and tested periodically; if one of these sections should happen to become full, items at that end of the memory are moved toward the center of the memory by interchanging until sufficient empty spaces are found."

The sorting method was tested on the Datatron computer.

"Automatic digital computers"

M. V. Wilkes, *Cambridge University Mathematical Laboratory*
Published by John Wiley & Sons, Inc. 1956.

For programmer
or student engineer

Here is a book "intended to provide a general introduction to the principles underlying the design and use of digital computers." The chapters cover the following: development (history) of computers, principles of logical design, principles of program construction, relay computers, storage, electronic switching and computing circuits, design and operation of digital computers. It has been written for the electronic engineer or student, or for the programmer who has the interest and background to seek further information about the equipment for which he is preparing programs. The text is written from the author's experience in working with English computers. It is liberally illustrated with plates and diagrams. Unfortunately, the selection of the type and the design of the pages do not provide particularly comfortable readability. Price: \$7.00.

"Sorting on electronic computer systems"

Edward Harry Friend, *New York Life Insurance Co., New York*
JOURNAL OF THE ASSOCIATION FOR COMPUTING MACHINERY, July 1956; pages 134-168.

Mathematics of tape sorting

A mathematician's approach to sorting problems is given. The methods compared are sorting by merging, internal sorting, and radix sorting.

Applications

Simplification techniques

"Integrated data processing"

*Robert A. Scudder, The Standard Register Company, Dayton, Ohio
OFFICE EXECUTIVE, August 1956; pages 15-19, 49.*

Examples are given of the use of integrated data processing techniques in manufacturing operations, department store operations, and other office routines which require repetitive data processing from the same source information. Both paper tape and card punching devices are described, plus the use of teletype equipment, slave typewriters, and magnetic-sensing devices for transmitting information. ((The IDP techniques are concerned with faster and more efficient transmittal of information. They do not necessarily bring about better engineering of business systems, although they are important in the final design of a business system.))

"Elecom 125 system handles inventory control"

ELECOM PULSE, Summer 1956; pages 6, 7.

Seven steps update file and prepare orders

File maintenance on the Elecom 125 is illustrated by the updating of an inventory file, and the preparation of shipping orders and customer invoices. The process is completed in seven steps consisting of: 1) conversion of input information on paper tape or cards to two magnetic tapes, one for customer names and addresses, the other for alterations; 2) sequencing the items on the alteration tape by stock code order; 3) using the alterations tape to select from the main inventory file tape those items to be acted upon; 4) updating these items according to the alterations tape, and producing a new updated tape and an orders tape; 5) sequencing the orders tape by requisition order; 6) sequencing names and addresses tape by requisition order; 7) preparing the shipping orders from the order tape and the name and address tape. It is pointed out that "in practice most efficient utilization of the System might dictate simultaneous use of both the File Processor and the Computer which is entirely possible, and is actually recommended."

"Electronic airline reservations"

*George Masters, Northwest Orient Airlines, Minneapolis
SYSTEMS MAGAZINE, July-August 1956; pages 6, 7, 34, 35.*

Univac

A description of the Univac Airlines Reservations System is given, along with a large, clear photograph of the agent's set, which enables the reader to trace the procedure of inquiring about availabilities and making reservations. (See DPD: August 1956, page 9; "Office Automation" up-dating service.)

Equipment

"Electronic equipment for savings and mortgage operation"

BANKING, August 1956; pages 73-80, 161.

ABA recommendations

The American Bankers Association has had a committee working on the application of electronics to the savings and mortgage functions of banks. This is the report of the subcommittee responsible for the work. Two types of equipment have been considered: "Off line," which means the posting of transactions at the teller's window, independent of the computer, but with simultaneous preparation of an input medium which can be entered into the computer later; "on line," which means that as transactions are posted at the teller's window they are entered directly into the computer, and automatically reflected in the bank's records.

Companies which are manufacturing or planning to manufacture "on-line" systems are Datamatic, IBM, Laboratory for Electronics (which is building DIANA), NCR, Sperry Rand, Teleregister, and Underwood.

Of these, only DIANA (designed for Chase Manhattan Bank), and Teleregister's Howard Savings Institution system are in the hardware state. DIANA will be installed during 1957. Howard's is already in operation. (See DPD June 1956, pg. 9, 10; August 1956, pg. 18.)

RCA Ultratype Camera and BIZMAC Electrofax Printer

High speed printing from electron-image tube

The RCA Ultratype Camera, designed to operate with the RCA BIZMAC System, photographs on 35 mm. film the image formed on the face of the electron-image tube, called the Compositron. The image is formed from binary coded characters accepted directly from magnetic tape. The data is edited by coded symbols as it comes into the system to be arranged into document form on the face of the tube. Character printing is at the rate of 4000 characters per second.

A companion device is the Electrofax Printer, which enlarges and prints the output of the Camera. A continuous 11" web of paper moves at a speed of 6 inches per second. The Camera locates successive film frames by sensing the sprocket pitches. Differences in the size of the documents after printing are sensed by a photo-electric cell in the printer which operates trimming shears. The printing process consists of four steps: Paper coated with a photo-sensitive material is charged with a negative voltage and grounded on a conductive plate; the paper is exposed to light through the positive film transparency; the latent image is developed by dusting it with a positively charged electroscopic powder; the powder image is fused by the application of heat.

Pamphlets giving more complete descriptions and illustrations can be obtained from Radio Corporation of America, Camden, New Jersey.

"Western Union and integrated data processing"

Robert F. Dirkes, Western Union Telegraph Company, New York

Paper tape devices

Lectures given by Mr. Dirkes at AMA Seminars are contained in two pamphlets, Parts I and II titled "Western Union and Integrated Data Processing." They contain descriptions of systems using teletype equipment, as well as other tape reading and tape perforating devices manufactured by Western Union. Several IDP systems now in use in cross-country operations as parts of a larger electronic business systems are described and diagrammed. Copies may be obtained from The Western Union Telegraph Company, 60 Hudson Street, New York 13, N. Y., Attn: Mr. George P. Oslin.

"Getting more mileage from electronic brains"

BUSINESS WEEK, August 25, 1956; page 87.

Three printers

Descriptions of three high-speed printers are given: Horizons, Inc. which prints by the Xerographic process from an image projected onto the Charactron tube; the Standard Register system and the General Electric ferromagnetography process.

Systems Design

"Controlling a business process"

*Richard G. Canning, Canning, Sisson & Assoc., Los Angeles
CONTROL ENGINEERING, September 1956; pages 114, 115.*

Business engineering

This article is part of a series directed toward the control engineer. It views business systems as a control engineering problem with less precise ways of measuring control, feedback, and the other factors found in a closed-loop type of operation.

Training

FILM SLIDE LECTURE

Programming concepts in easy stages

Basic Computer Lecture is the first in a series of tape recorded slide film lectures on computer programming offered for sale or rental by J. B. Rea Company. The computer lecture develops the basic concepts of programming by first describing the operation of a simple adding machine in typical computer language and then progressively expanding this simplified computer by introducing in sequence a memory, a stored program, a decision operation and finally the ability of a computer to modify its own instructions. A typed copy of the lecture and slides may be obtained for advanced study by the instructor or the leader of the group which is to participate. The lecture, including the 40-minute tape and 11 slides may be purchased for \$10 or rented for a ten-dollar deposit, with a refund of \$9 upon return within two weeks of the date used. For further information write Thomas H. Bauer, Manager, Computer Applications, J. B. Rea Company, 1723 Cloverfield Blvd., Santa Monica, California.

**October 29–November 2,
1956 – Cleveland, Ohio**

Special Seminar Program, Western Reserve University, School of Library Science: Machine Literature Searching, Operations Research Approach, Theory of Classification. For information write to Jesse H. Shera, Dean, School of Library Science, Western Reserve University, Cleveland 6, Ohio.

**November 15–16, 1956
New York City**

“Electronic Data Processing for Small and Medium-size Business,” seminar sponsored by AMA. *

**December 10–12, 1956
January 7–9, 1957
New York City**

“‘Integrated’ Data Processing,” seminar sponsored by AMA. *

*For information write: American Management Association, Attention, Franc M. Ricciardi, 1515 Broadway, New York 36, New York.

**February 4–8, 1957
Cleveland, Ohio**

Special Seminar Program, Western Reserve University, School of Library Science: Documentation Survey, Machine Aids to Librarianship, Special Libraries. For information, write as above. (See October 29 listing).

**January 30–February 1,
1957
Cleveland, Ohio**

Operations Research in the Planning of Computer and Data Processing Systems, Case Institute of Technology. For information write: W. W. Abendroth, Operations Research Group, Engineering Administration Dept., Case Institute of Technology, 10900 Euclid Avenue, Cleveland 6, Ohio.

Meetings

October 18, 19, 1956
Los Angeles, Calif.

Meeting of The Institute of Management Sciences, Statler Hotel. For information write: Bob Mellon, Litton Industries, 336 N. Foothill Road, Beverly Hills, California.

October 22-24, 1956
Philadelphia, Pa.

International Systems Meeting, Annual Convention of the Systems and Procedures Association of America, Bellevue-Stratford Hotel. For information write to J. A. MacQueen, Alan Wood Steel Co., Conshohocken, Pa.

November 8, 9, 1956
San Francisco, Calif.

N.M.A.A. Second Annual Electronic Business Systems Conference, sponsored by the eleven Western N.M.A.A. Chapters; Sheraton-Palace Hotel. For information, write to P. O. Box 3584 Rincon Annex, San Francisco, Calif.

November 12-16, 1956
Washington, D. C.

Third Institute on Electronics in Management, American University. For information write: Lowell H. Hattery, Institute Director, The American University, 1901 F Street, N. W., Washington 6, D. C.

November 15, 16, 1956
San Francisco, Calif.

Meeting of Operations Research Society of America. For further information, write T. E. Oberbeck, U.S. Naval Post Graduate School, Monterey, California.

November 15, 16, 1956
Chicago, Ill.

Second Annual Automation Conference for senior officers of companies, sponsored by University of Chicago.

November 26-30, 1956
New York City

Third International Automation Exposition and Computer Clinic. Trade Show Building. For information, write International Automation Exposition, 845 Ridge Ave., Pittsburgh 12, Pa.

November 26-27, 1956
New York City

"The Challenge of Automatic Data Processing to Senior Officers," sponsored by Third International Automation Exposition and Fordham University, at New Yorker Hotel.

November 28-29, 1956
New York City

"Human Engineering--Automation and Man," sponsored by Third International Automation Exposition and Manhattan College, at New Yorker Hotel.

December 10-12, 1956
New York City

Eastern Joint Computer Conference, Hotel New Yorker. Theme: "New Developments in Computers and Components." For information write: Albert J. Forman, Tele-Tech, 480 Lexington Ave., New York 17, N. Y.

February 26-28, 1957
Los Angeles, Calif.

Western Joint Computer Conference, Statler Hotel. Theme: "Techniques for Reliability." For information write: S. D. Wanlass, Systems Research Corp., 13729 Victory Blvd., Van Nuys, Calif.

May 12-16, 1957
Los Angeles, Calif.

International Conference and Exposition sponsored by NOMA. For information write 132 West Chelten Ave., Philadelphia 44, Pa.

References

The addresses of publishers and periodicals mentioned in this issue of Data Processing Digest are listed below for your convenience in obtaining further information about the articles or books listed.

The Accountant
4 Drapers' Gardens
Throgmorton Avenue
London EC2, England

American Management Association
1515 Broadway, Times Square
New York 36, N. Y.

Banking
12 East 36th Street
New York 16, N. Y.

Business Week
330 West 42nd Street
New York 36, N. Y.

Cambridge University Press
32 East 57th Street
New York 22, N. Y.

Control Engineering
330 West 42nd Street
New York 36, N. Y.

Cost and Management
66 King St. E.
Hamilton, Ontario, Canada

Elecom Pulse
Underwood Corp.
One Park Avenue
New York 16, N. Y.

Journal of Association for Computing Machinery
2 East 63rd St.
New York 21, N. Y.

Journal of Machine Accounting
53 West Jackson Blvd.
Chicago 4, Ill.

Management Science
Case Institute
Cleveland 6, Ohio

Office Executive
132 W. Chelten Ave.
Philadelphia 44, Pa.

Systems for Modern Management
315 Fourth Ave.
New York 10, N. Y.

Systems and Procedures Quarterly
Box 281 Wall St. Station
New York, N. Y.

John Wiley & Sons, Inc.
440 4th Avenue
New York 16, N. Y.

See DPD September 1956 for list of more than seventy periodicals regularly reviewed for significant information in the data processing and related fields.

DATA PROCESSING DIGEST is published each month by Canning, Sisson and Associates, 914 South Robertson Boulevard, Los Angeles 35, California. Subscription rate: \$24.00 per year. Foreign postage (exclusive of Canada and Mexico): \$1.00 additional. Single copies: \$3.00 when available. Editor: Margaret Milligan.